

Application Serial No. 10/604,504
Amendment dated APRIL 19, 2006
Reply to Office Action dated January 19, 2006

Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims

1. (Currently Amended) A medical device for navigation through anatomy, the medical device comprising:
an elongate body having a proximal end, a distal end, and a longitudinal axis extending at least from the proximal end to the distal end; and
a helical first coil formed from a wire having a substantially non-circular cross section;
and
said cross section having a greater dimension in the radial direction than in the axial direction.
2. (Original) The medical device of claim 1, said body comprising a tubular member having a plurality of slots configured to make said tubular member more flexible in bending.
3. (Original) The medical device of claim 1, said first coil being located at or near said distal end, said first coil substantially comprising a substantially radiopaque material.
4. (Original) The medical device of claim 3, said body comprising a tubular member having a plurality of slots configured to make said tubular member more flexible in bending, said body further comprising a core wire, at least part of said core wire being located inside said tubular member, at least a portion of said core wire being located inside said first coil.
5. (Withdrawn) The medical device of claim 1 further comprising a second coil sharing said longitudinal axis with at least said body.

Application Serial No. 10/604,504
Amendment dated APRIL 19, 2006
Reply to Office Action dated January 19, 2006

6. (Original) The medical device of claim 1, said medical device being a guidewire.
7. (Currently Amended) A medical device configured to be guided to a target location in anatomy, the medical device comprising:
a first tubular member having a proximal end and distal end;
a core wire extending proximally from said first tubular member, said core wire being attached with a joint to said first tubular member at least at said proximal end, said joint joining comprising:
a first coil circumscribing said core wire, said first coil being at least partially inside first said tubular member, wherein the first coil is formed from a wire having a substantially non-circular cross section, and
at least one of solder and adhesive.
8. (Original) The medical device of claim 7, said core wire being metal and said first coil being metal, said joint comprising solder attaching said first coil to said core wire and adhesive attaching at least one of said first coil, said core wire, and said solder, to said first tubular member.
9. (Withdrawn) The medical device of claim 7, said first tubular member having superelastic properties and at least part of said distal end being heat treated to reduce said superelastic properties at said distal end.
10. (Original) The medical device of claim 7 said first tubular member comprising a plurality of slots formed in said first tubular member, at least a plurality of said slots being substantially perpendicular to said axis, said slots being formed in a plurality of groups, and at least a plurality of said groups comprising a plurality of slots at substantially the same location along said axis.

Application Serial No. 10/604,504
Amendment dated APRIL 19, 2006
Reply to Office Action dated January 19, 2006

11. (Withdrawn) The medical device of claim 10, wherein at least some said groups, at least one said slot is substantially deeper than at least one other said slot.

12. (Withdrawn) The medical device of claim 7 further comprising a second tubular member circumscribing at least a portion of said core wire.

13. (Currently Amended) The medical device of claim 7, said first coil being formed from wire having a wire thickness ~~diameter~~, said first coil having at least a portion of its length with a pitch of at least 1.5 times said wire thickness ~~diameter~~.

14. (Original) The medical device of claim 7, said core wire having a tapered portion, said joint being located at least partially within said tapered portion.

15. (Withdrawn) The medical device of claim 7 further comprising a second coil having a larger outside coil diameter than said first coil.

16. (Withdrawn) The medical device of claim 7, said core wire having a feature configured to facilitate mechanical interlock of said at least one of solder and adhesive, said joint being located at said feature.

17. (Withdrawn) The medical device of claim 16, said feature comprising of at least one of a step and a ridge.

18. (Original) The medical device of claim 7, said first tubular member having a chamfer at said proximal end.

19. (Original) The medical device of claim 7, said core wire further being attached to said first tubular member at said distal end of said first tubular member.

Application Serial No. 10/604,504
Amendment dated APRIL 19, 2006
Reply to Office Action dated January 19, 2006

20. (Original) The medical device of claim 7, said core wire further being attached to said first tubular member at least one location intermediate said proximal end and said distal end.

21. (Withdrawn) The medical device of claim 7, said core wire having a proximal section proximal to said first tubular member, said proximal section having a first outside diameter along at least a majority of its length, and said first tubular member having a second outside diameter along at least a majority of its length, said first outside diameter being larger than said second outside diameter.

22. (Withdrawn) A medical device configured to be guided to a target location in anatomy, the medical device comprising:

a tubular member having a proximal end and a distal end and a plurality of slots configured to make said tubular member more flexible in bending; and

a core wire having a proximal section extending proximally from said tubular member, and a distal section located inside said tubular member, said core wire being attached to said tubular member at least at said proximal end; and

at least part of said proximal section having a substantially round cross section and at least part of said distal section having a flattened cross section.

23. (Withdrawn) The medical device of claim 22 further comprising substantially radiopaque material located inside said tubular member at said distal end.

24. (Withdrawn) The medical device of claim 23 said substantially radiopaque material having a substantially semicircular cross section and being located on opposite sides of said flattened cross section of said distal section of said core wire.

Application Serial No. 10/604,504
Amendment dated APRIL 19, 2006
Reply to Office Action dated January 19, 2006

25. (Currently Amended) A medical device with a stepped core wire configured to be guided to a target location in anatomy, the medical device comprising:

a tubular member having a proximal end and a distal end and a plurality of slots configured to make said tubular member more flexible in bending; and

a core wire having a proximal section extending proximally from said tubular member, and a distal section located at least partially inside said tubular member, said core wire comprising an abrupt change in cross-sectional dimension between said proximal section and said distal section; [[and]]

said core wire being attached to said tubular member at least at said proximal end, said proximal end abutting said abrupt change in cross-sectional dimension; and

a coil circumscribing at least a portion of said core wire, wherein the coil is formed from a wire having a substantially non-circular cross section.

26. (Cancelled)

27. (Currently Amended) The medical device of claim 25 [[26]], said coil being soldered to said core wire, said tubular member being attached at least to said coil with adhesive.

28. (Withdrawn) A medical device configured to be guided to a target location in anatomy, the medical device comprising:

a first tubular member having a proximal end and a distal end, and a longitudinal axis extending at least from the proximal end to the distal end;

a plurality of slots formed into said first tubular member and configured to make said first tubular member more flexible in bending;

a core wire extending proximally from said proximal end of said first tubular member; and

a first coil extending distally from said distal end of said first tubular member.

Application Serial No. 10/604,504
Amendment dated APRIL 19, 2006
Reply to Office Action dated January 19, 2006

29. (Withdrawn) The medical device of claim 28 further comprising a second tubular member sharing said longitudinal axis.

30. (Withdrawn) The medical device of claim 29, said second tubular member extending distally from said distal end of said first tubular member, said second tubular member being at least partially located inside said first coil.

31. (Withdrawn) The medical device of claim 29, said second tubular member comprising a plurality of slots configured to make said second tubular member more flexible in bending.

32. (Withdrawn) The medical device of claim 28, said first tubular member comprising a first portion without said slots and a second portion with said slots, said first portion being proximal to said second portion.

33. (Withdrawn) The medical device of claim 28, said core wire being attached with a joint to said first tubular member at least at said proximal end of said first tubular member, said joint comprising a second coil circumscribing said core wire, and said second coil being at least partially inside said first tubular member; and said joint further comprising at least one of solder and an adhesive attaching said second coil to said core wire and said first tubular member at least to said second coil.

34. (Withdrawn) The medical device of claim 33, said core wire comprising an abrupt change in cross-sectional dimension at said joint.

35. (Withdrawn) The medical device of claim 28, said slots being arranged in groups of three.

36. (Withdrawn) The medical of claim 28, said tubular member having a chamfer at said proximal end.

Application Serial No. 10/604,504
Amendment dated APRIL 19, 2006
Reply to Office Action dated January 19, 2006

37. (Withdrawn) The medical device of claim 28, said core wire having a distal tip being at least partially flattened.

38. (Withdrawn) A slotted medical device configured to navigate through anatomy, the medical device comprising:

a first tubular member having a proximal end, a distal end, and a longitudinal axis extending at least from the proximal end to the distal end;

a plurality of groups of slots formed into said first tubular member, at least a plurality of said groups comprising a plurality of slots at substantially the same location along said axis;

at least a plurality of said longitudinally adjacent said groups being rotated at an angle around said axis from the previous said group;

at least a plurality of said groups having at least three slots.

39. (Withdrawn) The medical device of claim 38, each said slot in at least a plurality of said groups being of substantially equal size and substantially equally spaced around said axis.

40. (Withdrawn) The medical device of claim 38, the spacing between said groups in the axial direction varying gradually along at least part of said first tubular member providing a varying bending stiffness along at least part of said first tubular member, said groups being more closely spaced in the axial direction at said distal end.

41. (Withdrawn) The medical device of claim 38, at least a plurality of said longitudinally adjacent said groups being rotated at an angle around said axis from the previous said group, said angle being 180 degrees divided by the number of slots in the group, plus or minus no more than 10 degrees.

42. (Withdrawn) The medical device of claim 38, at least a plurality of said groups consisting of three slots.

Application Serial No. 10/604,504
Amendment dated APRIL 19, 2006
Reply to Office Action dated January 19, 2006

43. (Withdrawn) The medical device of claim 38 further comprising a core wire disposed within said first tubular member and extending proximal therefrom, the medical device being a guidewire.

44. (Withdrawn) The medical device of Claim 43, said core wire being attached with a joint to said first tubular member at least at said proximal end of said first tubular member, said joint comprising a metal first coil soldered to said core wire, said first coil circumscribing said core wire, and said first coil being at least partially inside said first tubular member, and said joint further comprising an adhesive attaching at least said first coil to said first tubular member.

45. (Withdrawn) The medical device of Claim 43, said first tubular member extending distal to said distal tip of said core wire, said medical device further comprising at least one piece of radiopaque material inside said first tubular and distal to said distal tip of said core wire.

46. (Withdrawn) The medical device of Claim 43 further comprising a coil extending distal to said first tubular member, said core wire extending distal to said first tubular member inside said coil.

47. (Withdrawn) The medical device of Claim 46, said core wire being axially but not torsionally constrained relative to said coil at said distal tip of said core wire.

48. (Withdrawn) The medical device of Claim 38, said first tubular member having superelastic properties.

49. (Withdrawn) The medical device of Claim 48, said first tubular member having a tip, said tip having reduced superelastic properties.

Application Serial No. 10/604,504
Amendment dated APRIL 19, 2006
Reply to Office Action dated January 19, 2006

50. (Withdrawn) The medical device of Claim 38 further comprising a second tubular member attached to said medical device.

51. (Withdrawn) The medical device of Claim 50 said second tubular comprising a plurality of slots configured to make said second tubular member more flexible in bending.

52. (Withdrawn) The medical device of Claim 38, said first tubular member having a chamfer at said proximal end.

53. (Currently Amended) A medical device configured to navigate through anatomy, the medical device comprising:

a tubular member having a proximal end, a distal end, and a longitudinal axis extending at least from the proximal end to the distal end, the tubular member comprising a plurality of slots configured to make it more flexible in bending;

a core wire disposed at least partially within said tubular member and extending proximal therefrom, said core wire having a distal tip;

a joint attaching said core wire to said tubular member at said proximal end of said tubular member; [[and]]

at least one piece of radiopaque material inside said tubular member, at or adjacent to said distal end of said tubular member; and

said radiopaque material being a helical coil made of a wire having substantially non-circular cross section.

54. (Withdrawn) The medical device of Claim 53, at least a plurality of said slots being substantially perpendicular to said axis, said slots being formed in a plurality of groups, at least a plurality of said groups comprising a plurality of slots at substantially the same location along said axis, and wherein at least some said groups, at least one said slot is substantially deeper than at least one other said slot.

Application Serial No. 10/604,504
Amendment dated APRIL 19, 2006
Reply to Office Action dated January 19, 2006

55. (Currently Amended) The medical device of Claim 53, ~~said radiopaque material being a helical coil made of wire having substantially non-circular cross-section~~, said wire having a substantially greater dimension in the radial direction than in the axial direction after being formed into said coil core wire.

56. (Withdrawn) The medical device of Claim 53 further comprising a mesial coil proximal to said radiopaque material.

57. (Withdrawn) The medical device of Claim 53, said tubular member extending distally from said distal tip of said core wire, said radiopaque material being distal to said distal tip of said core wire.

58. (Original) The medical device of Claim 53, said core wire further being attached to said tubular member at said distal tip of said core wire.

59. (Original) The medical device of Claim 53, said core wire having at least one abrupt change in cross-sectional dimension, said abrupt change being at or adjacent to said joint.

Application Serial No. 10/604,504
Amendment dated APRIL 19, 2006
Reply to Office Action dated January 19, 2006

60. (Withdrawn) A medical device configured to navigate through anatomy, the medical device comprising:

a first tubular member having a proximal end, a distal end, and a longitudinal axis extending at least from the proximal end to the distal end,

the first tubular member comprising a plurality of slots configured to make it more flexible in bending;

a second tubular member sharing said longitudinal axis with said first tubular member; and

a core wire sharing said longitudinal axis with said first tubular member and said second tubular member;

said first tubular member being attached to at least one of said second tubular member and said core wire; and

said second tubular member being attached to at least one of said first tubular member and said core wire.

61. (Withdrawn) The medical device of Claim 60, said second tubular member being concentric with said first tubular member.

62. (Withdrawn) The medical device of Claim 60, said second tubular member being in line with said first tubular member.

63. (Withdrawn) The medical device of Claim 60, said second tubular member comprising a plurality of slots configured to make it more flexible in bending.

64. (Withdrawn) The medical device of Claim 60 further comprising a first coil concentric with at least one of said first tubular member, said second tubular member, and said core wire.

65. (Withdrawn) The medical device of Claim 64, said first coil being inside at least one of said first tubular member and said second tubular member.

Application Serial No. 10/604,504
Amendment dated APRIL 19, 2006
Reply to Office Action dated January 19, 2006

66. (Withdrawn) The medical device of Claim 64 further comprising a second coil circumscribing at least said core wire.

67. (Withdrawn) The medical device of Claim 60, said medical device being configured such that tensioning said core wire causes said distal end of said first tubular member to change in shape.

68. (Withdrawn) The medical device of Claim 67, at least some of said slots being deeper on one side of said axis than on the other side of said axis to facilitate said change in shape.

69. (Withdrawn) A tapered medical device configured to navigate through anatomy, the medical device comprising:

- a tubular member having a proximal end, a distal end, and a longitudinal axis extending at least from the proximal end to the distal end, at least a portion of said tubular member comprising a plurality of slots, said slots being configured to make said tubular member more flexible in bending;

- said slots being arranged in groups of at least two slots per group, wherein the slots in each group are formed at substantially the same location along said axis;

- at least a plurality of said groups being rotated at an angle around said axis from the previous said group;

- said angle being within the range of 140 degrees to 220 degrees divided by the number of slots in the group;

- a core wire disposed within said tubular member and extending proximal therefrom;

- said core wire being attached to said tubular member at least at said proximal end of said tubular member; and

- said tubular member having a taper at least in its outside diameter over at least a portion of its length, said taper having a decreasing outside diameter in the distal direction, said taper being at least one of continuous and incremental.

Application Serial No. 10/604,504
Amendment dated APRIL 19, 2006
Reply to Office Action dated January 19, 2006

70. (Withdrawn) The medical device of claim 69, said tubular member having a continuously tapered outside diameter over at least a portion of said tubular member.

71. (Withdrawn) The medical device of claim 69, said tubular member having an outside diameter that changes in at least one step between said proximal end and said distal end of said tubular member.

72. (Withdrawn) The medical device of claim 69, said tubular member comprising a plurality of sections having different outside diameters, the sections being attached to each other to form said tubular member.

73. (Withdrawn) A method of making a medical device with a radiopaque marker, the method comprising in any order at least the steps of:

forming a wire from radiopaque material, the wire having a cross section comprising two substantially flat opposite non-parallel sides, the sides being out of parallel by an angle;

winding the wire into a coil, the coil having a radius, the angle and the radius being selected such that the sides become substantially parallel when the wire is wound into the coil;
and

installing the marker coil on the medical device.

74. (Withdrawn) The method of claim 73, the wire having:
a substantially isosceles trapezoidal cross section before being wound; and
a substantially rectangular cross section after being wound.

75. (Withdrawn) The method of claim 73, the wire having a greater dimension in the radial direction than in the axial direction after being wound.

76. (New) The medical device of claim 1, wherein the wire having a substantially non-circular cross section has two substantially flat opposite non-parallel sides that are out of parallel by an angle prior to forming the helical coil.

Application Serial No. 10/604,504
Amendment dated APRIL 19, 2006
Reply to Office Action dated January 19, 2006

77. (New) The medical device of claim 76, wherein the sides become substantially parallel when the wire is wound into the helical coil.

78. (New) The medical device of claim 76, wherein the wire has a substantially isosceles trapezoidal cross section prior to forming the helical coil and a substantially rectangular cross section after forming the helical coil.

79. (New) The medical device of claim 7, wherein the wire having a substantially non-circular cross section has two substantially flat opposite non-parallel sides that are out of parallel by an angle prior to forming the first coil.

80. (New) The medical device of claim 79, wherein the sides become substantially parallel when the wire is wound into the first coil.

81. (New) The medical device of claim 79, wherein the wire has a substantially isosceles trapezoidal cross section prior to forming the first coil and a substantially rectangular cross section after forming the first coil.

82. (New) The medical device of claim 25, wherein the wire having a substantially non-circular cross section has two substantially flat opposite non-parallel sides that are out of parallel by an angle prior to forming the coil.

83. (New) The medical device of claim 82, wherein the sides become substantially parallel when the wire is wound into the coil.

84. (New) The medical device of claim 82, wherein the wire has a substantially isosceles trapezoidal cross section prior to forming the coil and a substantially rectangular cross section after forming the coil.

Application Serial No. 10/604,504
Amendment dated APRIL 19, 2006
Reply to Office Action dated January 19, 2006

85. (New) The medical device of claim 53, wherein the wire having a substantially non-circular cross section has two substantially flat opposite non-parallel sides that are out of parallel by an angle prior to forming the helical coil.

86. (New) The medical device of claim 85, wherein the sides become substantially parallel when the wire is wound into the helical coil.

87. (New) The medical device of claim 85, wherein the wire has a substantially isosceles trapezoidal cross section prior to forming the helical coil and a substantially rectangular cross section after forming the helical coil.